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Review for Unit 3 Test -

tasks

pages 181 – 183   #'s 1–8, 11–14, 16, 17, 19, 20, 23, 25–27, 67

(1) $y = x^5 - \frac{1}{8}x^2 + \frac{1}{4}x$

$y' = 5x^4 - \frac{1}{4}x + \frac{1}{4}$

(2) $y = 3 - 7x^3 + 3x^7$

$y' = -21x^2 + 21x^6$

(3) $y = 2\sin x\cos x$

$y' = 2\cos x\cos x + 2\sin x\cos x$

$y' = 2(\cos^2 x + \sin^2 x)$

$y' = 2$

(4) $y = \frac{2x+1}{2x-1}$

$y' = \frac{(2)(2x-1) - (2x+1)(2)}{(2x-1)^2} = \frac{4x - 2 - 4x - 2}{(2x-1)^2} = \frac{-4}{(2x-1)^2}$

(7) $y = \sqrt{x} + 1 + \frac{1}{\sqrt{x}}$ $x^{-\frac{1}{2}}$

$y' = \frac{1}{2}x^{-\frac{1}{2}} - \frac{1}{2}x^{-\frac{3}{2}}$

$y' = \frac{1}{2\sqrt{x}} - \frac{1}{2x^{\frac{3}{2}}}$

(5) $s = \cos(1-2t)$

$s' = -\sin(1-2t)(-2)$

$s' = +2\sin(1-2t)$

(6) $s = \cot\frac{2}{t}$ $= 2t^{-1}$

$s' = -\csc^2\left(\frac{2}{t}\right)\cdot\left(-2t^{-2}\right)$

$s' = \frac{2\csc^2\left(\frac{2}{t}\right)}{t^2}$

(8) $y = x\sqrt{2x+1}$

$y = x(2x+1)^{\frac{1}{2}}$

$y' = (1)(2x+1)^{\frac{1}{2}} + (x)\left(\frac{1}{2}\right)(2x+1)^{-\frac{1}{2}}(2)$

$y' = \sqrt{2x+1} + \frac{x}{\sqrt{2x+1}}$

$y' = \frac{2x+1+x}{\sqrt{2x+1}}$

$= \frac{3x+1}{\sqrt{2x+1}}$

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(11) $y = x^2 \csc 5x$

$y' = (2x)(\csc 5x) + (x^2)(5)(-\csc 5x \cot 5x)$

$y' = 2x \csc 5x - 5x^2 \csc 5x \cot 5x$

(12) $y = \ln \sqrt{x} = x^{\frac{1}{2}}$

$y' = \frac{1}{\sqrt{x}} \cdot \frac{1}{2} x^{-\frac{1}{2}}$

$y' = \frac{1}{2\sqrt{x}\sqrt{x}} = \frac{1}{2x}, \ x > 0$

(13) $y = \ln(1+e^x)$

$y' = \frac{1}{1+e^x} \cdot e^x$

$y' = \frac{e^x}{1+e^x}$

(14) $y = xe^{-x}$

$y' = 1(e^{-x}) + x(e^{-x})(-1)$

$y' = e^{-x} - xe^{-x}$

(16) $y = \ln(\sin x)$

$y' = \frac{1}{\sin x} \cdot \cos x$

$y' = \frac{\cos x}{\sin x} = \cot x$

(17) $r = \ln(\cos^{-1} x)$

$r' = \frac{1}{\cos^{-1} x} \cdot \frac{-1}{\sqrt{1-x^2}}$

$r' = \frac{-1}{\cos^{-1} x \sqrt{1-x^2}}$

(19) $s = \log_5 (t-7)$

$s' = \frac{1}{(t-7)\ln 5} \cdot 1$

$s' = \frac{1}{(t-7)\ln 5}, \ t > 7$

(20) $s = 8^{-t}$

$s' = 8^{-t} \ln 8 \cdot (-1)$

$s' = -8^{-t} \ln 8$

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23 $y = e^{\tan^{-1}x}$

$y' = e^{\tan^{-1}x} \cdot \frac{1}{1+x^2}$

$y' = \frac{e^{\tan^{-1}x}}{1+x^2}$

25 $y = t\sec^{-1} t - \frac{1}{2}\ln t$

$y' = (1)\sec^{-1} t + t\left(\frac{1}{|t|\sqrt{t^2-1}}\right) - \frac{1}{2}\left(\frac{1}{t}\right)(1)$

$= \sec^{-1} t + \frac{t}{|t|\sqrt{t^2-1}} - \frac{1}{2t}$

26 $y = (1+t^2)\cot^{-1} 2t$

$y' = (2t)(\cot^{-1} 2t) + (1+t^2)\left(\frac{-1}{1+(2t)^2}\right) \cdot 2$

$= 2t\cot^{-1} 2t + \frac{-2(1+t^2)}{1+4t^2}$

$= 2t\cot^{-1} 2t - \frac{2(1+t^2)}{1+4t^2}$

27 $y = z\cos^{-1} z - \sqrt{1-z^2} = z\cos^{-1} z - (1-z^2)^{\frac{1}{2}}$

$y' = (1)(\cos^{-1} z) + (z)\left(\frac{-1}{\sqrt{1-z^2}}\right) - \cancel{\frac{1}{2}}(1-z^2)^{-\frac{1}{2}}(-\cancel{2}z)$

$= \cos^{-1} z - \frac{z}{(1-z^2)^{\frac{1}{2}}} + \frac{z}{(1-z^2)^{\frac{1}{2}}}$

$= \cos^{-1} z$

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(61) (a) $3f(x)-g(x)$, @ $x=-1$

$= 3f'(-1) - g'(-1)$

$= 3(2) - (1)$

$= 6-1$

$= 5$

(b) $f^2(x)\, g^3(x)$, @ $x=0$

$= (f(x))^2 (g(x))^3$

$= 2f(x)\, f'(x)\, g^3(x) + f^2(x)\cdot 3\cdot g^2(x)\cdot g'(x)$

$= 2\cdot f(0)\cdot f'(0)\cdot g^3(0) + f^2(0)\cdot 3\cdot g^2(0)\cdot g'(0)$

$= 2\cdot(-1)\cdot(-2)\cdot(-3)^3 + (-1)^2\cdot 3\cdot(-3)^2\cdot 4$

$= -2\cdot -2\cdot -27 + 1\cdot 3\cdot 9\cdot 4$

$= -108 + 108$

$= 0$

(c) $g(f(x))$, @ $x=-1$

$= g'(f(x))\cdot f'(x)$

$= g'(f(-1))\cdot f'(-1)$

$= g'(0)\cdot f'(-1)$

$= 4\cdot 2$

$= 8$

(d) $f(g(x))$, @ $x=-1$

$= f'(g(x))\cdot g'(x)$

$= f'(g(-1))\cdot g'(-1)$

$= f'(-1)\cdot g'(-1)$

$= 2\cdot 1$

$= 2$

(e) $\dfrac{f(x)}{g(x)+2}$, @ $x=0$

$= \dfrac{f'(x)(g(x)+2) - f(x)\cdot g'(x)}{(g(x)+2)^2}$

$= \dfrac{(-2)(-3+2) - (-1)(4)}{(-3+2)^2}$

$= \dfrac{-2(-1)+4}{1} = 6$

(f) $g(x+f(x))$, @ $x=0$

$= g'(x+f(x))\cdot(1+f'(x))$

$= g'(0+-1)\cdot(1+(-2))$

$= g'(-1)\cdot(-1)$

$= 1\cdot -1$

$= -1$